



## EHMT1 gene

euchromatic histone lysine methyltransferase 1

### Normal Function

The *EHMT1* gene provides instructions for making an enzyme called euchromatic histone methyltransferase 1. Histone methyltransferases are enzymes that modify proteins called histones. Histones are structural proteins that attach (bind) to DNA and give chromosomes their shape. By adding a molecule called a methyl group to histones, histone methyltransferases can turn off (suppress) the activity of certain genes, which is essential for normal development and function.

### Health Conditions Related to Genetic Changes

#### Kleefstra syndrome

Kleefstra syndrome, a disorder affecting many parts of the body, is caused by the loss of the *EHMT1* gene or by mutations that disable its function.

Most people with Kleefstra syndrome are missing a sequence of about 1 million DNA building blocks (base pairs) on one copy of chromosome 9 in each cell. The deletion occurs near the end of the long (q) arm of the chromosome at a location designated q34.3, a region containing the *EHMT1* gene. Some affected individuals have shorter or longer deletions in the same region.

The loss of the *EHMT1* gene from one copy of chromosome 9 in each cell is believed to be responsible for the characteristic features of Kleefstra syndrome in people with the 9q34.3 deletion. However, the loss of other genes in the same region may lead to additional health problems in some affected individuals.

About 25 percent of individuals with Kleefstra syndrome do not have a deletion of genetic material from chromosome 9; instead, these individuals have mutations in the *EHMT1* gene. Some of these mutations change single protein building blocks (amino acids) in euchromatic histone methyltransferase 1. Others create a premature stop signal in the instructions for making the enzyme or alter the way the gene's instructions are pieced together to produce the enzyme. These changes generally result in an enzyme that is unstable and decays rapidly, or that is disabled and cannot function properly.

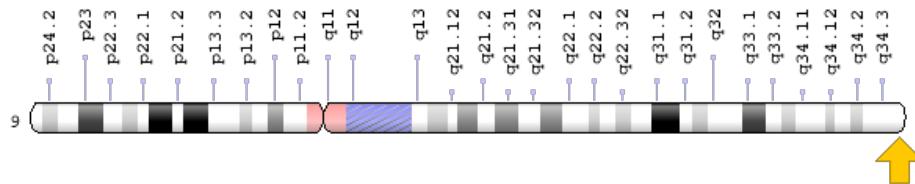
Either a deletion or a mutation affecting the *EHMT1* gene results in a lack of functional euchromatic histone methyltransferase 1 enzyme. A lack of this enzyme impairs proper control of the activity of certain genes in many of the body's organs

and tissues, resulting in the abnormalities of development and function characteristic of Kleefstra syndrome.

## Chromosomal Location

Cytogenetic Location: 9q34.3, which is the long (q) arm of chromosome 9 at position 34.3

Molecular Location: base pairs 137,618,988 to 137,836,127 on chromosome 9 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

## Other Names for This Gene

- bA188C12.1
- DEL9q34
- DKFZp667M072
- EHMT1\_HUMAN
- Eu-HMTase1
- euchromatic histone-lysine N-methyltransferase 1
- EUHMTASE1
- FLJ12879
- FP13812
- G9a like protein
- G9a-like protein 1
- GLP
- GLP1
- H3-K9-HMTase 5
- histone H3-K9 methyltransferase 5
- histone-lysine N-methyltransferase, H3 lysine-9 specific 5

- KIAA1876
- KMT1D
- lysine N-methyltransferase 1D
- RP11-188C12.1

## **Additional Information & Resources**

### Educational Resources

- Molecular Cell Biology (fourth edition, 2000): Eukaryotic Nuclear DNA Associates with Histone Proteins to Form Chromatin  
<https://www.ncbi.nlm.nih.gov/books/NBK21500/#A2248>

### GeneReviews

- Kleefstra Syndrome  
<https://www.ncbi.nlm.nih.gov/books/NBK47079>

### Scientific Articles on PubMed

- PubMed  
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28EHMT1%5BTIAB%5D%29+OR+%28%28Eu-HMTase1%5BTIAB%5D%29+OR+%28G9a+like+protein%5BTIAB%5D%29+OR+%28KMT1D%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D>

### OMIM

- EUCHROMATIC HISTONE METHYLTRANSFERASE 1  
<http://omim.org/entry/607001>

### Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology  
[http://atlasgeneticsoncology.org/Genes/GC\\_EHMT1.html](http://atlasgeneticsoncology.org/Genes/GC_EHMT1.html)
- ClinVar  
<https://www.ncbi.nlm.nih.gov/clinvar?term=EHMT1%5Bgene%5D>
- HGNC Gene Family: Ankyrin repeat domain containing  
<http://www.genenames.org/cgi-bin/genefamilies/set/403>
- HGNC Gene Family: Lysine methyltransferases  
<http://www.genenames.org/cgi-bin/genefamilies/set/487>
- HGNC Gene Family: SET domain containing  
<http://www.genenames.org/cgi-bin/genefamilies/set/1399>

- HGNC Gene Symbol Report  
[http://www.genenames.org/cgi-bin/gene\\_symbol\\_report?q=data/hgnc\\_data.php&hgnc\\_id=24650](http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=24650)
- NCBI Gene  
<https://www.ncbi.nlm.nih.gov/gene/79813>
- UniProt  
<http://www.uniprot.org/uniprot/Q9H9B1>

## Sources for This Summary

- OMIM: EUCHROMATIC HISTONE METHYLTRANSFERASE 1  
<http://omim.org/entry/607001>
- Kleefstra T, Brunner HG, Amiel J, Oudakker AR, Nillesen WM, Magee A, Geneviève D, Cormier-Daire V, van Esch H, Fryns JP, Hamel BC, Sistermans EA, de Vries BB, van Bokhoven H. Loss-of-function mutations in euchromatin histone methyl transferase 1 (EHMT1) cause the 9q34 subtelomeric deletion syndrome. *Am J Hum Genet.* 2006 Aug;79(2):370-7. Epub 2006 Jun 13.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/16826528>  
*Free article on PubMed Central:* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1559478/>
- Kleefstra T, Smidt M, Banning MJ, Oudakker AR, Van Esch H, de Brouwer AP, Nillesen W, Sistermans EA, Hamel BC, de Bruijn D, Fryns JP, Yntema HG, Brunner HG, de Vries BB, van Bokhoven H. Disruption of the gene Euchromatin Histone Methyl Transferase1 (Eu-HMTase1) is associated with the 9q34 subtelomeric deletion syndrome. *J Med Genet.* 2005 Apr;42(4):299-306.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/15805155>  
*Free article on PubMed Central:* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1736026/>
- Kleefstra T, van Zelst-Stams WA, Nillesen WM, Cormier-Daire V, Houge G, Foulds N, van Dooren M, Willemse MH, Pfundt R, Turner A, Wilson M, McGaughran J, Rauch A, Zenker M, Adam MP, Innes M, Davies C, López AG, Casalone R, Weber A, Brueton LA, Navarro AD, Bralo MP, Venselaar H, Stegmann SP, Yntema HG, van Bokhoven H, Brunner HG. Further clinical and molecular delineation of the 9q subtelomeric deletion syndrome supports a major contribution of EHMT1 haploinsufficiency to the core phenotype. *J Med Genet.* 2009 Sep;46(9):598-606. doi: 10.1136/jmg.2008.062950. Epub 2009 Mar 4.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/19264732>
- Stewart DR, Kleefstra T. The chromosome 9q subtelomere deletion syndrome. *Am J Med Genet C Semin Med Genet.* 2007 Nov 15;145C(4):383-92. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/17910072>
- Willemse MH, Beunders G, Callaghan M, de Leeuw N, Nillesen WM, Yntema HG, van Hagen JM, Nieuwint AW, Morrison N, Keijzers-Vloet ST, Hoischen A, Brunner HG, Tolmie J, Kleefstra T. Familial Kleefstra syndrome due to maternal somatic mosaicism for interstitial 9q34.3 microdeletions. *Clin Genet.* 2011 Jul;80(1):31-8. doi: 10.1111/j.1399-0004.2010.01607.x. Epub 2011 Jan 10.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/21204793>
- Yatsenko SA, Brundage EK, Roney EK, Cheung SW, Chinault AC, Lupski JR. Molecular mechanisms for subtelomeric rearrangements associated with the 9q34.3 microdeletion syndrome. *Hum Mol Genet.* 2009 Jun 1;18(11):1924-36. doi: 10.1093/hmg/ddp114. Epub 2009 Mar 17.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/19293338>  
*Free article on PubMed Central:* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2678925/>

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